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Test 1460: John Deere 4650 PowerShift Diesel 15-Speed

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NEBRASKA TRACTOR TEST 1460
JOHN DEERE 4650 POWERSHIFT DIESEL
15 SPEED

POWER TAKE-OFF PERFORMANCE

| Power Hp (kW) | Crank shaft speed rpm | Fuel Consumption | | | Temperature °F (°C) | | | | Barometer inch Hg (kPa) |
|--|--------------------------------|-------------------|-----------------------|-----------------------|---------------------|--------------------|--------------------|--------------------|-------------------------------|
| | | gal/hr (l/h) | lb/hp.hr (kg/kW.h) | Hp.hr/gal (kW.h/l) | Cooling medium | Air wet bulb | Air dry bulb | | |
| MAXIMUM POWER AND FUEL CONSUMPTION | | | | | | | | | |
| Rated Engine Speed—Two Hours (PTO Speed—998 rpm) | | | | | | | | | |
| 165.52 (123.43) | 2200 | 9.761 (36.949) | 0.411 (0.250) | 16.96 (3.341) | 184 (84.6) | 61 (15.9) | 75 (23.8) | 28.990 (97.895) | |
| VARYING POWER AND FUEL CONSUMPTION—Two Hours | | | | | | | | | |
| 143.77 (107.21) | 2249 | 8.819 (33.384) | 0.428 (0.260) | 16.30 (3.211) | 181 (82.8) | 62 (16.4) | 76 (24.2) | | |
| 0.00 (0.00) | 2338 | 2.601 (9.846) | | | 167 (75.0) | 60 (15.8) | 74 (23.6) | | |
| 73.44 (54.76) | 2297 | 5.676 (21.486) | 0.539 (0.328) | 12.94 (2.549) | 176 (80.3) | 60 (15.6) | 74 (23.3) | | |
| 165.38 (123.32) | 2200 | 9.799 (37.093) | 0.413 (0.252) | 16.88 (3.325) | 186 (85.3) | 62 (16.4) | 76 (24.4) | | |
| 37.04 (27.62) | 2316 | 4.132 (15.641) | 0.778 (0.474) | 8.96 (1.766) | 170 (76.7) | 62 (16.4) | 76 (24.2) | | |
| 108.94 (81.24) | 2271 | 7.340 (27.785) | 0.470 (0.286) | 14.84 (2.924) | 180 (81.9) | 60 (15.8) | 74 (23.6) | | |
| Av Av | 88.10 (65.70) | 2279 (24.208) | 6.395 (0.308) | 0.506 (0.308) | 13.78 (2.714) | 177 (80.3) | 61 (16.1) | 75 (23.9) | 28.983 (97.872) |

DRAWBAR PERFORMANCE WITH BIAS PLY TIRES

| Power Hp (kW) | Drawbar pull lbs (kN) | Speed mph (km/h) | Crank- shaft speed rpm | Slip % | Fuel Consumption | | | Temp. °F (°C) | | | Barom. inch Hg (kPa) |
|---|--------------------------------|------------------------|---------------------------------|-----------|-------------------|-----------------------|-----------------------|---------------------|--------------------|--------------------|----------------------------|
| | | | | | gal/hr (l/h) | lb/hp.hr (kg/kW.h) | Hp.hr/gal (kW.h/l) | Cool- ing med | Air wet bulb | Air dry bulb | |
| Maximum Available Power—Two Hours 10th Gear | | | | | | | | | | | |
| 137.31 (102.39) | 8250 (36.70) | 6.24 (10.05) | 2200 | 4.12 | 9.639 (36.487) | 0.490 (0.298) | 14.25 (2.806) | 187 (85.8) | 65 (18.3) | 74 (23.3) | 28.760 (97.118) |
| 75% of Pull at Maximum Power—Ten Hours 10th Gear | | | | | | | | | | | |
| 109.42 (81.60) | 6345 (28.22) | 6.47 (10.41) | 2266 | 3.49 | 8.324 (31.509) | 0.531 (0.323) | 13.15 (2.590) | 178 (80.8) | 41 (5.1) | 42 (5.4) | 28.834 (97.368) |
| 50% of Pull at Maximum Power—Two Hours 10th Gear | | | | | | | | | | | |
| 74.57 (55.61) | 4231 (18.82) | 6.61 (10.64) | 2290 | 2.43 | 6.593 (24.958) | 0.617 (0.375) | 11.31 (2.228) | 175 (79.4) | 33 (0.6) | 36 (1.9) | 29.210 (98.638) |
| 50% of Pull at Reduced Engine Speed—Two Hours 13th Gear | | | | | | | | | | | |
| 74.79 (55.77) | 4231 (18.82) | 6.63 (10.67) | 1437 | 2.43 | 5.214 (19.735) | 0.486 (0.296) | 14.35 (2.826) | 175 (79.2) | 36 (2.2) | 41 (5.0) | 29.235 (98.722) |

MAXIMUM POWER IN SELECTED GEARS

| | | | | | | | | | | | |
|--------------------|------------------|-----------------|------|-------|-----------|--|--|---------------|--------------|--------------|--------------------|
| 127.27 (94.91) | 16746 (74.49) | 2.85 (4.59) | 2222 | 14.78 | 5th Gear | | | 181 (82.5) | 39 (3.9) | 45 (7.2) | 29.230 (98.705) |
| 136.66 (101.91) | 15138 (67.34) | 3.39 (5.45) | 2200 | 10.05 | 6th Gear | | | 184 (84.4) | 62 (16.7) | 70 (21.1) | 28.770 (97.152) |
| 141.03 (105.16) | 13171 (58.59) | 4.02 (6.46) | 2199 | 7.41 | 7th Gear | | | 185 (85.0) | 61 (16.1) | 68 (20.0) | 28.780 (97.186) |
| 138.12 (103.00) | 11040 (49.11) | 4.69 (7.55) | 2201 | 5.72 | 8th Gear | | | 185 (85.0) | 60 (15.6) | 66 (18.9) | 28.780 (97.186) |
| 137.98 (102.89) | 9472 (42.13) | 5.46 (8.79) | 2202 | 4.85 | 9th Gear | | | 184 (84.4) | 58 (14.4) | 64 (17.8) | 28.780 (97.186) |
| 140.62 (104.86) | 8460 (37.63) | 6.23 (10.03) | 2200 | 4.04 | 10th Gear | | | 182 (83.3) | 55 (12.8) | 60 (15.6) | 28.790 (97.220) |
| 139.47 (104.00) | 7220 (32.12) | 7.24 (11.66) | 2198 | 3.47 | 11th Gear | | | 185 (85.0) | 63 (17.2) | 71 (21.7) | 28.770 (97.152) |
| 143.33 (106.88) | 6621 (29.45) | 8.12 (13.06) | 2200 | 3.22 | 12th Gear | | | 185 (84.7) | 64 (17.8) | 73 (22.8) | 28.770 (97.152) |

LUGGING ABILITY IN 10th GEAR

| | | | | | | | |
|----------------------|--|--------------------|--------------------|--------------------|-------------------|-------------------|------------------|
| Crankshaft Speed rpm | | 2200 | 1986 | 1765 | 1543 | 1312 | 1096 |
| Pull—lbs (kN) | | 8460 (37.63) | 9532 (42.40) | 10375 (46.15) | 11066 (49.22) | 10792 (48.01) | 9081 (40.39) |
| Increase in Pull % | | 0 | 13 | 23 | 31 | 28 | 7 |
| Power—Hp (kW) | | 140.62 (104.86) | 141.88 (105.80) | 136.62 (101.88) | 126.93 (94.65) | 105.31 (78.53) | 74.86 (55.82) |
| Speed—Mph (km/h) | | 6.23 (10.03) | 5.58 (8.98) | 4.94 (7.95) | 4.30 (6.92) | 3.66 (5.89) | 3.09 (4.98) |
| Slip % | | 4.04 | 4.85 | 5.32 | 5.64 | 5.64 | 4.53 |

| TRACTOR SOUND LEVEL WITH CAB | Radial Ply | | Bias Ply | |
|---|------------|----------|----------|----------|
| | 2000 RPM | 2200 RPM | 2000 RPM | 2200 RPM |
| Maximum Available Power—Two Hours | 75.5 | 76.5 | 76.5 | |
| 75% of Pull at Maximum Power—Ten Hours | | | 76.0 | |
| 50% of Pull at Maximum Power—Two Hours | | | 77.0 | |
| 50% of Pull at Reduced Engine Speed—Two Hours | | | 73.5 | |
| Bystander in 15th gear | | | 88.0 | |

Department of Agricultural Engineering

Dates of Test: October 9-28, 1982

Manufacturer: JOHN DEERE TRACTOR
WORKS, P.O. Box 270, Waterloo, Iowa 50702

FUEL, OIL AND TIME: Fuel No. 2 Diesel
Cetane No. 46.6 (rating taken from oil company's inspection data) Specific gravity converted to 60°/60° (15°/15°) 0.8379 Fuel weight 6.977 lbs/gal (0.836 kg/l) Oil SAE 15W-40 API service classification CD, CC, SD To motor 4.601 gal (17.415 l) Drained from motor 4.253 gal (16.099 l) Transmission and final drive lubricant John Deere Hy-Gard transmission and hydraulic fluid Total time engine was operated 60.5 hours.

ENGINE: Make John Deere Diesel Type six cylinder vertical with turbocharger and intercooler Serial No. *RG6466A231034* Crankshaft lengthwise Rated rpm 2000 to 2200 Bore and stroke 4.57" × 4.75" (116.0 mm × 120.6 mm) Compression ratio 15.8 to 1 Displacement 466 cu in (7636 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements Oil filter one full flow paper cartridge Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil Fuel filter two paper elements with prestrainer Muffler vertical Cooling medium temperature control three thermostats and variable speed fan.

CHASSIS: Type standard with duals Serial No. *RW4650P001183* Tread width rear 63" (1600 mm) to 130" (3300 mm) front 60.2" (1530 mm) to 86.3" (2192 mm) Wheel base 118.5" (3010 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 31.5" (800 mm) Vertical distance above roadway 45.3" (1151 mm) Horizontal distance from center of rear wheel tread 0.3" (8 mm) to the right Hydraulic control system direct engine drive Transmission selective gear fixed ratio with full range operator controlled powershift Advertised speeds mph (km/h) first 1.3 (2.1) second 1.9 (3.1) third 2.3 (3.7) fourth 2.9 (4.7) fifth 3.3 (5.3) sixth 3.8 (6.1) seventh 4.3 (7.0) eighth 5.0 (8.0) ninth 5.7 (9.2) tenth 6.5 (10.5) eleventh 7.5 (12.0) twelfth 8.4 (13.5) thirteenth 10.4 (16.7) fourteenth 14.5 (23.4) fifteenth 18.0 (29.0) reverse 1.8 (2.9), 2.6 (4.2), 4.0 (6.4), 6.0 (9.7) Clutch wet multiple disc hydraulically power actuated and operated by foot pedal Brakes wet disc hydraulically power actuated and operated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 165" (4.2 m) left 165" (4.2 m) (on concrete surface without brake) right 181" (4.6 m) left 181" (4.6 m) Turning space diameter (on concrete surface with brake applied) right 346" (8.79 m) left 346" (8.79 m) (on concrete surface without brake) right 380" (9.65 m) left 380" (9.65 m) Power take-off 998 rpm at 2200 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

SUPPLEMENTAL TESTS
DRAWBAR PERFORMANCE WITH RADIAL PLY TIRES

| POWER AND FUEL CONSUMPTION AT 2200 RPM | | | | | | | | | | | |
|---|--------------------------------|------------------------|---------------------------------|-----------|-------------------|-----------------------|-----------------------|---------------------|--------------------|---|--------------------|
| Power Hp (kW) | Drawbar pull lbs (kN) | Speed mph (km/h) | Crank- shaft speed rpm | Slip % | Fuel Consumption | | | Temp. °F (°C) | | | |
| | | | | | gal/hr (l/h) | lb/hp.hr (kg/kW.h) | Hp.hr/gal (kW.h/l) | Cool- ing med | Air wet bulb | Barom. dry bulb inch Hg (kPa) | |
| Maximum Available Power—Two Hours 10th Gear | | | | | | | | | | | |
| 140.48 (104.76) | 8052 (35.82) | 6.54 (10.53) | 2201 | 1.90 | 9.728 (36.826) | 0.483 (0.294) | 14.44 (2.845) | 182 (83.3) | 49 (9.4) | 59 (14.7) | 29.115 (98.317) |

| MAXIMUM POWER IN SELECTED GEARS | | | | | | | | | | |
|---------------------------------|------------------|-----------------|------|-------|-----------|---------------|--------------|--------------|--------------------|--|
| 127.06 (94.75) | 18794 (83.60) | 2.54 (4.08) | 2221 | 14.64 | 4th Gear | 179 (81.4) | 43 (6.1) | 50 (10.0) | 29.050 (98.097) | |
| 142.05 (105.93) | 16586 (73.78) | 3.21 (5.17) | 2199 | 5.30 | 5th Gear | 183 (83.9) | 56 (13.3) | 70 (21.1) | 29.060 (98.131) | |
| 145.80 (108.73) | 14787 (65.77) | 3.70 (5.95) | 2202 | 4.15 | 6th Gear | 185 (85.0) | 57 (13.9) | 70 (21.1) | 29.060 (98.131) | |
| 145.69 (108.64) | 12723 (56.59) | 4.29 (6.91) | 2200 | 3.14 | 7th Gear | 186 (85.6) | 57 (13.9) | 70 (21.1) | 29.060 (98.131) | |
| 141.88 (105.80) | 10698 (47.58) | 4.97 (8.00) | 2201 | 2.46 | 8th Gear | 186 (85.3) | 57 (13.9) | 70 (21.1) | 29.070 (98.165) | |
| 141.47 (105.49) | 9232 (41.06) | 5.75 (9.25) | 2199 | 2.03 | 9th Gear | 185 (85.0) | 57 (13.9) | 69 (20.6) | 29.080 (98.199) | |
| 143.07 (106.68) | 8205 (36.50) | 6.54 (10.52) | 2199 | 1.86 | 10th Gear | 184 (84.4) | 54 (12.2) | 65 (18.3) | 29.110 (98.300) | |
| 140.74 (104.95) | 6980 (31.05) | 7.56 (12.17) | 2200 | 1.51 | 11th Gear | 185 (85.0) | 56 (13.3) | 70 (21.1) | 29.060 (98.131) | |
| 146.06 (108.92) | 6465 (28.76) | 8.47 (13.64) | 2200 | 1.42 | 12th Gear | 185 (84.7) | 56 (13.3) | 70 (21.1) | 29.060 (98.131) | |

| LUGGING ABILITY IN 10th GEAR | | | | | | |
|------------------------------|--------------------|--------------------|--------------------|-------------------|-------------------|------------------|
| Crankshaft Speed rpm | 2199 | 1981 | 1762 | 1535 | 1323 | 1092 |
| Pull—lbs (kN) | 8205 (36.50) | 9252 (41.15) | 10072 (44.80) | 10604 (47.17) | 10227 (45.49) | 8657 (38.51) |
| Increase in Pull % | 0 | 13 | 23 | 29 | 25 | 6 |
| Power—Hp (kW) | 143.07 (106.68) | 144.90 (108.05) | 140.04 (104.43) | 128.20 (95.60) | 106.61 (79.50) | 74.74 (55.73) |
| Speed—Mph (km/h) | 6.54 (10.52) | 5.87 (9.45) | 5.21 (8.39) | 4.53 (7.30) | 3.91 (6.29) | 3.24 (5.21) |
| Slip % | 1.86 | 2.12 | 2.29 | 2.46 | 2.46 | 2.12 |

POWER AND FUEL CONSUMPTION AT 2000 RPM
POWER TAKE-OFF PERFORMANCE

| Power Hp (kW) | Crank shaft speed rpm | Fuel Consumption | | Temperature °F (°C) | | | Barometer inch Hg (kPa) | |
|---|--------------------------------|-------------------|-----------------------|-----------------------|-------------------|--------------------|-------------------------------|--------------------|
| | | gal/hr (l/h) | lb/hp.hr (kg/kW.h) | Hp.hr/gal (kW.h/l) | Cooling medium | Air wet bulb | | Air dry bulb |
| MAXIMUM POWER AND FUEL CONSUMPTION | | | | | | | | |
| Rated Engine Speed—One Hour (PTO Speed—907 rpm) | | | | | | | | |
| 168.59 (125.72) | 2000 | 9.420 (35.659) | 0.390 (0.237) | 17.90 (3.526) | 183 (83.7) | 61 (15.9) | 75 (23.8) | 28.985 (97.878) |

DRAWBAR PERFORMANCE WITH RADIAL PLY TIRES

| Power Hp (kW) | Drawbar pull lbs (kN) | Speed mph (km/h) | Crank- shaft speed rpm | Slip % | Fuel Consumption | | | Temp. °F (°C) | | | Barom. inch Hg (kPa) |
|---|--------------------------------|------------------------|---------------------------------|-----------|-------------------|-----------------------|-----------------------|---------------------|--------------------|--------------------|----------------------------|
| | | | | | gal/hr (l/h) | lb/hp.hr (kg/kW.h) | Hp.hr/gal (kW.h/l) | Cool- ing med | Air wet bulb | Air dry bulb | |
| Maximum Available Power—Two Hours 10th Gear | | | | | | | | | | | |
| 144.10 (107.46) | 9121 (40.57) | 5.93 (9.54) | 2001 | 2.25 | 9.531 (36.080) | 0.461 (0.281) | 15.12 (2.978) | 182 (83.1) | 47 (8.1) | 54 (12.2) | 29.020 (97.996) |
| MAXIMUM POWER IN SELECTED GEARS | | | | | | | | | | | |
| 147.50 (109.99) | 14250 (63.39) | 3.88 (6.25) | 2000 | 3.57 | 7th Gear | | | 186 (85.6) | 57 (13.9) | 70 (21.1) | 29.060 (98.131) |
| 145.22 (108.29) | 9183 (40.85) | 5.93 (9.54) | 1999 | 1.94 | 10th Gear | | | 186 (85.3) | 56 (13.3) | 68 (20.0) | 29.080 (98.199) |
| 148.86 (111.00) | 7265 (32.32) | 7.68 (12.37) | 2000 | 1.60 | 12th Gear | | | 184 (84.4) | 56 (13.3) | 70 (21.1) | 29.060 (98.131) |

| | | Bias Ply Tires | | | Radial Ply Tires | | |
|----------------------------------|---------|----------------------------|--|----------------------------|----------------------------|--|----------------------------|
| TIRES, BALLAST AND WEIGHT | | With Ballast | | Without Ballast | With Ballast | | Without Ballast |
| Rear Tires | Ballast | Four 20.8-38; 10; 14 (95) | | Four 20.8-38; 10; 14 (95) | Four 20.8R38; 10; 12 (85) | | Four 20.8R38; 10; 12 (85) |
| | | 500 lb (227 kg) | | None | 310 lb (141 kg) | | None |
| | | None | | None | None | | None |
| Front Tires | Ballast | Two 14L-16.1; 10; 44 (305) | | Two 14L-16.1; 10; 44 (305) | Two 14L-16.1; 10; 44 (305) | | Two 14L-16.1; 10; 44 (305) |
| | | None | | None | None | | None |
| | | 38 lb (17 kg) | | None | 38 lb (17 kg) | | None |
| Height of Drawbar | | 24.5 in (620 mm) | | 24.5 in (620 mm) | 24.5 in (620 mm) | | 24.5 in (620 mm) |
| Static Weight with Operator—Rear | | 14650 lb (6645 kg) | | 13650 lb (6192 kg) | 14710 lb (6672 kg) | | 14090 lb (6391 kg) |
| | | 5010 lb (2273 kg) | | 4935 lb (2239 kg) | 5030 lb (2282 kg) | | 4955 lb (2248 kg) |
| | | 19660 lb (8918 kg) | | 18585 lb (8430 kg) | 19740 lb (8954 kg) | | 19045 lb (8639 kg) |

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 120°F (48.6°C). Eight gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1460.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers



John Deere 4650 Powershift Diesel